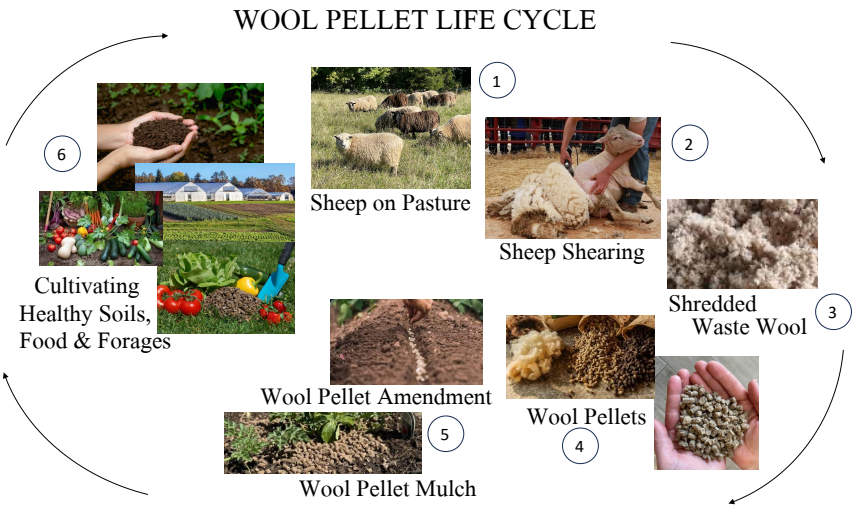
NCR-SARE FARMER RANCHER GRANT 2024

Marble Hill Farm and Mavourneen Farm

Monroe County, Indiana

Integrating Sheep Wool Pellets with Specialty Crop Systems to Enhance Soil Health, Water Storage, Carbon Sequestration, and Plant Production



Sheep Wool Pellet Sample Analysis

Analysis	Analysis Result (%)	Pounds Per Ton
Moisture	6.07	121
Solids	93.33	1879
Ash @550 C	11.64	232.9
Organic Matter (LOI @ 550 C)	82.29	1645.7
Organic Carbon (LOI @ 550 C)	47.73	954.5
Carbon:Nitrogen Ratio (C:N)		5.2:1
Nitrogen, Total (TKN)	9.093	181.9
Phosphorous (P)	.113	5.2 (as P_2O_5)
Potassium (K)	2.581	62.0 (as K_2O)
Sulfur (S)	2.15	43.0
Magnesium (Mg)	.13	2.7
Calcium (Ca)	.51	10.3
Sodium (Na)	.23	4.6
Aluminum (Al)	1589	3.2
Copper (Cu)	24	<0.1
Iron (Fe)	1555	3.1
Manganese (Mn)	105	0.2
Zinc (Zn)	124	0.2

Select Data Farmer Rancher Grant: **Marble Hill Farm**

Water Sample

TEST FACTOR	MHF Field
Total Chlorine (ppm)	.07
pH	7.6
Alkalinity (ppm)	56.0
Calcium (ppm)	27.0
Cyanuric Acid (ppm)	5.0
Total Iron (ppm)	.10
Copper (ppm)	0.0
Phosphate (ppb)	0.0

MHF Potato Field: Grown with Mustard and Overhead Irrigation

Soil Samples

Soil Samples MHF Field

Crop: Potatoes Grown with Mustard

TEST FACTOR	Pre-Test MHF Field (May 2024)	Potato MHF Field No Amend (Sept. 2024)	Potato MHF Field Pellet (Sept. 2024)
Organic Matter (%)	6.1	7.3	8.5
Phosphorous (ppm)	250	257	461
Potassium (ppm)	304	425	473
Magnesium (ppm)	335	395	555
Calcium (ppm)	2650	2650	3450
Sodium (ppm)		19	24
pH	6.9	7.0	7.2
Sulfur (ppm)	15	22	32
Zinc (ppm)	9.9	10.5	17.5
Manganese (ppm)	52	55	52
Iron (ppm)	62	53	74
Copper (ppm)	2.1	1.5	1.8
Boron (ppm)	0.9	1.0	1.7
CEC (meq/100g)	17.1	17.7	23.2

*CEC (Cation Exchange Capacity) is a measure of the soils ability to retain nutrients.

Environmental Data for MHF Field

Month (2024)	Average Daily Temperature (ºF)	Average Daily Humidity (%)	Maximum Daily Temperature	Minimum Daily Temperature
May (20 Days)	68.0	76.5	88.8	52.0
June	73.5	73.0 (100-33)	93.0	44.0
July	75.0	79.0 (100-43)	95.0	53.0
August	75.0	77.0 (100-36)	107.0	53.0
September	71.0	72.0 (100-24)	107.0	46.0

Maximum temperatures reflect sensor placement relative to direct sun exposure.

GROWING NOTES

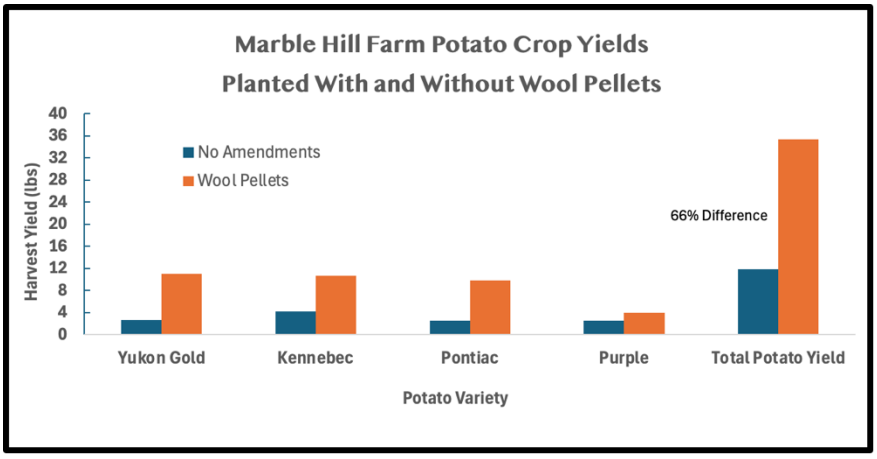
Wool Pellet Application, Planting, Watering, and Pest Pressure for Potatoes

Rows: 22ft long
Wool Pellet Application Rate: .25 lbs/ft. or 5.5 lbs per row
Wool Pellet Nitrogen Application Rate: 0.5 lbs/22' row
Planting Protocol: 1' trench with pellets spread in trench by hand and covered with composted dirt from farm. Potatoes were planted directly into trench and covered with trenched dirt. Apart from the pellets, the non-pelleted rows were planted the same so that both received farm composted dirt and were mulched with straw. Each potato row was bounded by a 3' row of mustard and a 2' path.
Watering: Overhead irrigation was used. The watering rate was adjusted for growth and environmental conditions.
Pest Pressure: No pest pressure was noted for potatoes.

Harvest Yields

MHF Field Crop: Potatoes Grown with Mustard

POTATO VARIETY [MHF]	Potato Days to Harvest	Potato No Amend Yield (lbs)	Potato Pellet Yield (lbs)
Yukon Gold	112	2.65	10.98
Kennebec	112	4.24	10.64
Pontiac	114	2.49	9.83
Purple	114	2.50	3.94
Total Harvest (lbs)		**11.88**	**35.39**



Select Data Farmer Rancher Grant: **Mavourneen Farm**

Water Sample

TEST FACTOR	MAVF Field B
Total Chlorine (ppm)	.02
pH	7.6
Alkalinity (ppm)	54.0
Calcium (ppm)	52.0
Cyanuric Acid (ppm)	5.0
Total Iron (ppm)	.10
Copper (ppm)	0.0
Phosphate (ppb)	0.0

Mavourneen Potato Field: Grown in Mounds with Overhead Irrigation

Soil Samples

Soil Samples Mavourneen Farm Field B

Crop: Potato

TEST FACTOR	Field B Pre-Test (May 2024)	Field Potato Growers Standard (October 2024)	Field Potato Pellet (October 2024)
Organic Matter (%)	3.9	4.1	3.9
Phosphorous (ppm)	22	48	17
Potassium (ppm)	104	128	76
Magnesium (ppm)	125	125	105
Calcium (ppm)	1400	1400	1250
Sodium (ppm)		26	19
pH	6.7	6.4	6.4
Sulfur (ppm)	15	16	13
Zinc (ppm)	5.7	7.5	8.9
Manganese (ppm)	121	103	103
Iron (ppm)	25	10	9
Copper (ppm)	2.9	2.5	2.4
Boron (ppm)	1.2	1.0	1.0
CEC (meq/100g)	9.5	9.7	8.6

*CEC (Cation Exchange Capacity) is a measure of the soils ability to retain nutrients.

Environmental Data for Mavourneen Farm Field B

Month (2024)	Average Daily Temperature (ºF)	Average Daily Humidity (%)	Maximum Daily Temperature	Minimum Daily Temperature
June (17 days)	81	64 (96-26.5)	115	58
July	78	70 (98-27)	107	51
August	78	70 (98-25)	116	48
September	72	69 (100-18)	114	42

Maximum temperatures reflect sensor placement relative to direct sun exposure.

GROWING NOTES

Grower's Standard (GS) Amendment and Application, Pellet Application, Planting, Watering, and Pest Pressure for Potatoes

Rows: 100ft long and 3" wide (300ft^2)
Wool Pellet Application Rate: 20lbs/300ft^2 (15 tilled, 5 side dressed).
Balanced with grower's standard (200lbs N/acre).
Wool Pellet Nitrogen Application Rate: .5lbs per 100 ft row
Planting Protocol: Bed preparation was done in advance of planting. Amendments tilled into soil. See tables below for amendment applications. Potatoes planted and mounded throughout growing. Potatoes grown with wool pellets were side-dressed with 5 lbs wool pellets during the growing season.
Watering: Overhead irrigation was used. The watering rate was adjusted for growth and environmental conditions.
Pest Pressure: Colorado potato beetle noted for both pellet and GS potatoes.
Soil Temperature and Moisture: No difference was noted in soil temperatures. Soil moisture determined with irrometer tended to show greater moisture retention in the wool pellet beds; however, there was not enough data collected for definitive results to be reported.

Mavourneen Farm Typical Soil Amendments (Growers Standard)

Amendment	Composition
Revita Compost Plus 3-4-3	• Composted poultry manure, leonardite ore, kelp • N 3%, P 4%, K 3% • Humic Acid 1% • N= 1.2% water soluble & 1.8% water insoluble
Sulfate of Potash 0-0-50	• Mined, all natural source of potash without chlorine • K 50%, Sulfur 18%
Guided Nitrogen 12-0-0	• Feather meal, diatomaceous earth, leonardite ore, molasses, kelp • N 12 %, 1% water soluble & 11% water insoluble • Humic Acid 2 %
Azomite	• Mined from locations where volcanic eruptions enter seawater • Source of wide spectrum of minerals and micronutients

Amendments Applied Field B	Growers Standard (lbs/100' Row)	Wool Pellet (lbs/100' Row)
Azomite	3	3
Rock Phos	14	
Revita	9.1	
Wool Pellets		20
Guided Nitrogen	13	
Zinc (oz)	5.2	5.6

Balanced for Nitrogen at 200lbs/acre

Tissue Analysis

Mavourneen Farm Potato Crop

TEST FACTOR	Potato Wool Pellet	Potato Growers Standard (GS)
Nitrogen (%)	4.80	4.60
Phosphorous (%)	.27	.28
Potassium (%)	2.5	2.02
Magnesium (%)	.58	.75
Calcium (%)	2.68	3.15
Sulfur (%)	.35	.33
Sodium (%)	.006	.006
Zinc (ppm)	9.84	9.72
Manganese (ppm)	109.0	68.57
Iron (ppm)	270.9	187.3
Copper (ppm)	6.03	5.48
Boron (ppm)	27.72	28.17

Harvest Yields

Mavourneen Field Crop: Potatoes

POTATO VARIETY	Potato Days to Harvest	Potato Growers Standard (GS) Yield (lbs)	Potato Wool Pellet (WP) Yield (lbs)	Yield Difference WP and GS (lbs)
Butterball	112	133.5	97.5	-36 (27%)